Migration from Natural 2.1 for OpenVMS

Natural 5.1 for OpenVMS offers better migration capabilities for customers still using Natural 2.1.7. Some major restrictions that prevented migration up to Natural Version 3.1 have been removed with Natural for UNIX/OpenVMS Version 4.1 or 5.1 and considerable performance improvements will ease the migration. The following procedures describe the migration process and summarize the remaining differences in handling between Natural Version 2.1 and Natural Version 5.1 for OpenVMS.

For additional enhancements and features see the Release Notes for UNIX and OpenVMS. See also the Installation Guide for UNIX and OpenVMS.

Migration Process

You are recommended to carry out the following steps to migrate an application from Natural Version 2.1 to Natural Version 5.1:

1. Unload all of your source members, including the DDM files from the Adabas FUSER and FDIC system files using the Natural utility SYSTRANS in your Natural 2.1 environment. For more information refer to the SYSTRANS Utility documentation.
   Note:
   If your Natural Version 2.1 source files use line numbers and these numbers are referenced as labels, you are recommended to use the RENUMBER system command before unloading the source files.
   Because the compiler and the data editor in Version 2.1 are more flexible in some cases, the transferring of files may cause some incompatibilities which can be avoided by changing the source files in Version 2.1 before using the SYSTRANS utility:
   - Comment lines in a data area must be defined using an ’ * ’ in column ’ T ’.
   - Fields, which are defined in a parameter data area, should not have any initial value definitions.
   - The length of initial values for variables in a data area should not exceed the format length definition of the variable itself.
2. Load the transfer file with the SYSTRANS Utility of your Natural 5.1 environment.
3. Use the summary of differences to determine which members of your Natural 2.1 application have to be adjusted to be able to run under Natural 5.1 and/or attempt a first CATALL to find out the necessary code changes. Note that the summary only lists the differences known to Software AG.
4. Adjust your application; use the summary as a checklist.
5. After you have done all necessary changes, recatalog your application in the target environment using the CATALL command.
6. Several iterations of these steps or parts of them might be necessary.
7. Check and adjust your DCL procedures if needed.
8. Modify your 3-GL functions to correspond to the new CALL structure or use the CALL interface for your old unchanged external images as described later.
9. Define your keyboard layout to match the layout used in your Natural 2.1 application using the NATTERMCAP utility.
10. Set up the necessary NATPARM modules.
11. Set up your Global Configuration File. Take care that your DBID definitions for Adabas files are different from the DBID definitions used for the FNAT and FUSER system files.
12. Test your application.
13. **For Natural Security users only**:
    Install Natural Security 5.1 in Natural 5.1 environment. The security data definitions in the FSEC database file have to be converted to adjust internal security data representations. Use SECULD with Transfer Option=Y in your NSC217 environment to unload the FSEC and load the data with SECLOAD and transfer=2 in your NSC51 environment.
14. **For Predict users only**:
    To use the old FDIC data, you are recommended to unload the FDIC data with Predict 3.2 in your Natural 2.1.7 environment using the "Unload Migrate" function. Install a new Predict 4.1 based on Natural 5.1 with a new empty FDIC system file, and load your FDIC data into this folder using the "Load Migrate" function.

    For further information, see your Predict documentation.

Restrictions up to Natural Version 3.1 that are Removed with Natural for UNIX/OpenVMS Version 4.1 or 5.1

This section summarizes the most important changes made in Natural for UNIX/OpenVMS Version 4.1 or 5.1 to make the migration easier.

Batch Support

Starting with Natural for UNIX/OpenVMS Version 4.1, Natural offers full batch support. The new batch support corresponds to the batch support implementation of Natural 2.1.7. For a detailed description, see Natural in Batch Mode in the operations documentation.

Source Size Extension

The maximum size of a single source for all source types in Natural has been extended from approximately 128 KB to 1 MB.

GP Size Extension

The size restriction of 64K for the Compiler generated tables of a cataloged object are removed.

Concatenate Strings for Display

It is now possible to display fields in maps as well as in DISPLAY, WRITE and INPUT statements without a delimiting character in between.

This can be achieved with field positioning 0X or tabulation nT or line/column positioning with x/y.

Note: The parameter Spacing Factor SF does not support value 0.

Natural Debugger

The remote Natural Debugger running on Windows with a graphical user interface can be used to debug applications on OpenVMS. To install the remote debugger, see the Remote Debugger in the installation documentation.

For further information, see the Natural Debugging documentation.

DEFINE WORK FILE Statement

The DEFINE WORK FILE statement can be used to assign a file name to a Natural work file. The work-file name may be up to 253 characters long. With the type clause in the DEFINE WORK FILE statement, the file type can be specified and overwrites the default type derived from the filename extension. Type "SAG" is compatible with the file format generated with Natural 2.1.7.

3GL Calls Natural

It is possible to invoke Natural subprograms from a program written in a third-generation programming language (3GL).

For details, see the description in the file READMEMY3GL.TXT in the directory NATDIR:[V511.samples.sysexuex].

KEY Command

The KEY command is now available.

Note: Parameters separated with blanks must be embedded in quotes.

LIST COUNT Command

The LIST COUNT command is now available.

STRUCT Command

The STRUCT command is now available.

SYSUNLD - Utility Unloading and Loading

The library SYSUNLD contains the following two utilities: NATUNLD and NATLOAD.

- NATUNLD is used to *unload* Natural programming objects, error messages and DDMs from system files onto a work file.
- NATLOAD is used to *load* Natural programming objects, error messages and DDMs from a work file into system files.

SYSTEM Variables

The following System Variables are now available:

- *CPU-TIME
- *DATV
- *DATVS
- *PATCH-LEVEL
- *PID

RTL and DBCS Support

RTL and DBCS Support is now available with the international version of Natural.

Summary of Differences between Versions 2.1 and 5.1

This section summarizes the remaining differences in handling between Natural Version 2.1 for OpenVMS and Natural Version 5.1 for OpenVMS.

Functionality Not Available Under Natural Version 5.1

REDEFINE Statement

In Version 2.1 for OpenVMS within the REDEFINE statement (in reporting mode), one could define a variable. This is no longer available under Version 5.1.
The compiler shows NAT0038: "Invalid field reference in REDEFINE base field".

The field to be used as the base field in a REDEFINE statement may be a user-defined variable or a database field. If it is a user-defined variable, it must have been previously defined. If it is a database field, it must be a field within an active loop.

Example:

```
REDEFINE #A(A10) ( #B(A2) #C(A8) )
```

worked under Version 2.1, but no longer works under Version 5.1.

It can be rewritten in the following way:

```
RESET #A(A10)
REDEFINE #A ( #B(A2) #C(A8) )
```

System Files

Objects are stored on the file system rather than in database system files. Therefore, you can not set FMODE=RMS and OMODE=RMS. The command extensions "/RMS" and "/DB" are also not supported.

Predict data (FDIC database system file) can be used, but existing DDMs are transferred to the file systems. DDMs are stored in user libraries or steplibs. The DDM Utility stores DDM files on the file system. Security data (FSEC database system file) are accessible.

Adabas protected system files are not supported.

RMS and RDB system files are not supported because the corresponding database interfaces are not supported (see RMS Communication and RDB Communication).

Running Natural without the Dynamic Buffer Pool

The dynamic buffer pool must be activated to run Natural. The dynamic parameter NOBP is not supported.

TPU Editor

The TPU editor is still available, but not integrated. The only integrated editor is the Software AG Editor. You can therefore not select an editor (such as LSE, EDT, EVE, EVE_W, LSE_W, CMZUL) from within Natural. The TPU editor, however, can be defined as an external editor in the Natural parameter module (NATPARM). To do this, you use the EDITOR profile parameter.

Natural Professional

The Natural Professional components, especially MONITOR and VERIFY, are not available.

CTRL+L and CTRL+B - Recalling Commands

You cannot use the key combinations CTRL+L or CTRL+B to recall a command. For this purpose, you use the LAST command.

#SET and #SHOW Commands

Both the #SET and the #SHOW trace commands are not available. You can, however, trace database calls with Natural 5.1.

FDIC Verification Rules

To enable you to access the FDIC verification rules, Predict must be installed on your site.

RMS Communication and RDB Communication

These two database interfaces are not available. It is planned to offer an OSX Interface for RDB as well as RMS. As these interfaces provide SQL based functionality and no Adabas like features, applications have to be adjusted to use the interfaces. Especially the transaction logic has to be proved thoroughly.

Natural Version 1 Compatibility

Functionality which can be activated with the NATPARM parameter NAT1COMP=ON is not supported, for example multiple-value fields or periodic groups with a variable number of occurrences.

Extended I/O Functions Not Supported

- Free cursor positioning (backward positioning). In Version 2.1, it was not necessary to position fields on the screen from the top left to the bottom right corner.
- The parameter Spacing Factor SF does not support the value 0.
- The *output-format* variable value ’0T’ in DISPLAY, WRITE and INPUT statements is not valid.
- Multiple attributes for one field.
- A window position of (0,0) which was valid under Version 2.1.
- Switching to a semi-graphic character set by setting AD=X.

Some of these functions were only supported with the parameter VM=ON in Natural 2.1.

Hardcopy Key

Definition of a hardcopy key is not possible.

Special Key Functions

Special key functions like GOLD+V are not available.

Block-Mode Terminals

Block-mode terminals like VT330 and VT340 are not supported.

REGIS Support

Not available.

Data Format Integer I8

The undocumented support of the Integer I8 format is no longer available with Natural 5.1.

Data Format Conversions

The following conversions of data formats available under Version 2.1 are not available under Version 5.1:

- Alphanumeric to Floating-point
- Alphanumeric to Packed
- Alphanumeric to Numeric
- Alphanumeric to Integer

To transfer data in the above-mentioned format, one can use the " MOVE EDITED" statement or the VAL function.

Using System Variables as Parameters

You cannot use system variables as parameters in statements, for example in the statements CALLNAT, FETCH, READ, FIND and STORE.

Natural Profile Parameters Not Available

The following profile parameters are not available:

Parameter	Description
ADATRACE	DBMS tracing
CAPTIVE	Exit Natural instead of returning to command prompt
COLOR	Control the sending of color attributes to the terminal
COMSTRING	Default command string at Natural prompt
CTRLC/CTRLZ	CTRL+C and CTRL+Z key definitions
DEBUG	Embed debugging code in generated programs
DUMP	Generate table dump on exception
ENTIND	Optional status line display
FMODE	DB or RMS file system access (sources)
KM	Keypad mode for VT terminals (numeric or application)
MAXSTMT	Maximum number of statements
MONITOR	Embed monitoring code in generated programs
NACONV	Numeric to alphanumeric conversion option (dependent on the VM parameter, which is not available either)
NPCREP	Non-printable character representation
NSTACK	Sizing parameter for the Natural stack
OMODE	DB or RMS file system access (objects)
SCREEN	Ignore AD=I or not
TYPEAHEAD	Enables/disables type-ahead buffering (enabled by default in Version 5.1)
VM	VMS mode (and all dependent parameters)
WPOP	Option to close work files/reports upon program termination

Natural Profile Parameters with Different Meaning

Parameter	Natural 2.1	Natural 5.1
CDYNAM	Number of images which may be dynamically loaded	Switch dynamic loading of non-Natural programs ON or OFF
TIMEOUT	Internal Natural timer between screen interactions	Request timeout (RPC)

OpenVMS-Specific System Variables Not Supported

The following OpenVMS-specific system variables are not supported:

- *DBID
- *DIRECT-IOS
- *ERROR-SYMBOL
- *FNR
- *PAGE-FAULTS
- *RDB-STATUS
- *SYSPRIV
- *VERSION
- *WORKING-SET

Instead of *VERSION the System Variable *NATVERS can be used.

OpenVMS-Specific User Exits

Some OpenVMS or RDB or RMS -specific user exits, which were delivered in the Version 2.1 library SYSEXT, are not available.

USR0621	RMS: close/reopen an RMS file
USR1001	close TPU mailbox
USR1003	RDB: switch transaction mode (multiple,single)
USR1004	RDB: free RFA or DBKEY table
USR1008	switch physical linesize from 80 to 132
USR1010	RDB: close all read-only transactions
USR1015	toggle PF-key definitions on/off

Functionality Implemented Differently Under Natural 5.1.

The following functionality is implemented in a different way, which may have more or less impact on existing applications or environments:

Real Batch Mode

The real batch mode support with Natural 5.1 is even more flexible than the batch mode support of Natural 2.1. To run Natural in real batch mode you have to specify the dynamic parameter BATCHMODE. The definition of the input and output channels is different as shown in the following table:

Action	**Natural Version 2.1**	**Natural Version 5.1**
Activate Batch Mode	-	Specify dynamic parameter BATCHMODE
Define channel for Commands	Define logical symbol NATURAL$COMMAND	Set parameter CMSYNIN
Define channel for Input Data	Define logical symbol NATURAL$INPUT	Set parameter CMOBJIN
Define channel for Output	Define logical symbol NATURAL$OUTPUT	Set parameter CMPRINT

Optionally, you may set the parameter BMSIM to VM to generate output as for Natural Version 2.1.

Work Files

Natural 5.1 supports different work file types. The type can be defined with the optional TYPE operand in the DEFINE WORK FILE statement or by default is derived from the file name extension. Work files (1 to 32) with type 'SAG' -binary format- are created with RMS file format variable length, whereas all other files are created with RMS file format stream line feed and record attributes carriage return carriage control. That means only work files with type SAG (TYPE operand 'SAG' or extension '.SAG') are compatible with Natural 2.1 work files, because Natural 2.1 always creates binary work files for all file name extensions. If compatible work files are needed and the extension of the work file name is not 'SAG', then the new TYPE operand must be specified. If the work file records should be sorted using the OpenVMS Sort utility, it is recommended to use binary work files.

Default Work File, Printer Names and Paths

If the work file is not defined with the DEFINE WORK FILE statement, the following different rules are applied:

Workfile	Natural Version 2.1	Natural Version 5.1
Name	NATWORKnn.DAT	userid_etid_nn.SAG
Path	current directory	TMP_PATH as defined in Natural.INI, if no work file specification is set.

If no report assignments are defined in NATPARM (Version 5.1) and no DEFINE PRINTER statement is used, the following conventions are used:

Printer	Natural Version 2.1	Natural Version 5.1
Name	NATREPnn.LIS	LPT1.
Path	current directory	current directory

CALL Statement

Parameters are not passed by reference. The new structure-oriented call interface is more environment-portable.

It is possible to invoke a program written in a third-generation programming language (3GL) from a Natural program via the call interface MYAPI, using a call structure that corresponds to the one used in Version 2.1. This means that Natural programs invoking 3GL programs need not be modified.

For details about the call interface, see the description in the file READMEMYAPI.TXT in the directory NATDIR:[V511.samples.sysexuex].

Arithmetic Expressions with Binary Variables

The internal representation of binary or hexadecimal values (especially B1, B2, B4, B8) differs from Version 2.1 to Version 5.1. Arithmetic expressions with binary variables are no longer allowed. All other statements like IF, REDEFINE and all database access statements with binary variables must be checked because the binary values internally may have a different byte order in Version 2.1 and 5.1. We recommend you to use variables with integer format instead of binary variables wherever the byte order is relevant.

DEFINE PRINTER Statement

In Natural Version 5.1, the printer name is predefined (NATPARM). More than 8 characters are not allowed.

Natural Startup Parameter

Embedding strings in <> are no longer valid. ( ) may be omitted but are necessary if parameters are separated with blanks or semicolons. The STACK parameter must be embedded within ( ). If uppercase/lowercase translation is not wanted, the whole string including the ( ) should be embedded within quotes. This may have an impact on defined (foreign) commands used to start Natural and your existing DCL command procedures.

Default Parameter Module

If you start Natural without defining a parameter module explicitly, Natural 2.1 will take the parameter module named like the OpenVMS userid. Natural 5.1 uses the default parameter module 'NATPARM'.

Free Cursor Positioning

If you start Natural 5.1 it is initially not possible to move the cursor anywhere on the screen. With the terminal command %T+ or the corresponding SET CONTROL statement you can switch to free cursor positioning. Now you can move the cursor on protected fields. However the fields remain write-protected.

Natural Exit Codes

With Natural 5.1 there are two types of Natural exit codes:

- Startup errors, where Exit Code 1 is taken as success and all other exit codes are assumed to indicate errors. Currently startup error codes from 1 up to 63 are used.
- Errors generated by the TERMINATE statement, where exit codes from 0 to 255 are possible.

If Natural fails during startup or is terminated by the TERMINATE statement, you can query the exit code from within a DCL file. As opposed to Natural for UNIX, Natural for OpenVMS does not return low return code values like "12" (startup error "Parameter module not found") Instead, Natural for OpenVMS adds the value "268,435,456" to the Natural error code one would get using Natural for UNIX. If this value were not added, the image run-down handler would interpret the value "12" as a Natural internal access violation and a system access violation message would be printed out.

Exception:
If Natural is terminated via the TERMINATE statement with Value 0, Natural exits with Exit Code 1. The reason for that behaviour is, that under OpenVMS the C-runtime makes no difference between an exit (0) and an exit (1) statement. In both cases, a 1 is returned.

Recommendation:
The value of $STATUS does not explain if this is a startup error or an error generated by the TERMINATE statement. For Natural Version 5.1.1 about 60 startup errors are defined. For that reason, use Exit Codes 100 to 255 for TERMINATE, otherwise you could not clearly indicate the reason for the exit.

3GL Calling Natural

The NATCALL interface of Natural 2.1 to call Natural from third-generation languages is not supported in the same way. As mentioned above, Natural subprograms can be called from 3GL languages. See Invoking Natural Subprograms from 3GL Programs.

Operating System Calls

The Natural interface to the DCL is different. All NATDCL calls must be changed to SHCMD calls. SHCMD has no command length parameter. Natural 5.1 will manipulate return codes from the control interpreter in the following way:

Even numbers are interpreted as error codes and are retained unchanged.
Odd numbers are interpreted as success codes and are converted to 0.

The following return code values are available:

0	Command successfully executed
4	Illegal SHCMD parameter specified
all others codes	Command has returned an error

$ Command - Spawning to the Operating System

The ’$’ command to spawn to the operating system is not available. Instead, Natural Version 5.1 has an exit to the operating system in its main menu.

Other Differences

- Version 5.1 always checks the line size overflow at compilation.
- Version 5.1 rejects fields in a parameter data area that have any initial value definitions.
- Natural Version 5.1 for OpenVMS AXP has IEEE floating-point format instead of F-Floating or D-Floating format in Version 2.1. Adabas data can still have the F-Floating or D-Floating format because they can be accessed transparently by Natural Version 5.1.
- The precision of intermediate results for arithmetic operations may differ. Check Compute/Assign staements for the appropriate definition of the intermediate results since the precision of intermediate results is now compated at compile time. Refer to the **COMPUTE ROUNDED** option in the COMPUTE statement.
- The internal representation of constants differs.
  If the type of the constant is not defined (only possible for named constants) the Natural 2.1 representation is packed format and Natural 5.1 normally creates I2 constants.
- With Natural 5.1 the keyword REPORT cannot used as synonym for PRINTER in the DEFINE PRINTER statement.
- Natural 5.1 rejects the LIST FILE command, only the LIST VIEW command is valid. Natural 2.1 accepted both commands.
- SET CONTROL ’R’ does no screen refresh with Natural 5.1, use the terminal command %RN instead.
- Natural 5.1 rejects labels with loop-closing statements like END-FOR <label>.
- With Natural 5.1 it is not possible to invoke a helproutine via a CALLNAT. In Natural 2.1 this check was missing.
- Natural 5.1 includes the keys ’PGUP’ and ’PGDN’ in the range of keys for *PFKEY.

Natural Version 5.1 Utilities

Program Editor

The Natural 5.1 Program Editor always generates line numbers. The lines are renumbered automatically.

NATPARM Utility (Natural Parameter Module)

The Natural parameter module (NATPARM) is a separate application which must be started outside Natural. The parameter file structure is different. Existing *.NPI files cannot be used. New parameter modules for all users must be generated using the NATPARM Utility.

The Natural 5.1 NATPARM utility can be invoked with **NAT51PARM**.

See the Profile Parameters for further information.

NATTERMCAP Utility (Natural Termcap Utility)

The NATTERMCAP Utility is a separate application which must be started outside Natural. The NATTERMCAP Utility is used to create, modify and test terminal capabilities described in the terminal database SAGtermcap. You can neither define individual keys nor the hardcopy key within the NATTERMCAP utility. Also this cannot be done in the Natural parameter module as it was with Natural 2.1.

The Natural 5.1 NATTERMCAP utility can be invoked with **NAT51TERMCAP**.

For further information, see the NATTERMCAP Utility.

Natural-based Products

The following products run with Natural Version 5.1:

- Natural Security Version 5.1
- Predict 4.1.2
- Construct 3.3.4

